THE RELATIONSHIP OF CHRONIC INFECTIONS TO MENTAL DISORDERS.

by

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THE RELATIONSHIP OF CHRONIC INFECTIONS TO MENTAL DISORDERS.

In dealing with such a subject it would not be out of place to begin with a very brief résumé of the history of its development.

The importance of auto-infection or auto-intoxication in its relation to the aetiology of mental disorders has long been recognised, but it is only comparatively recently that the study of this has been put on a scientific basis.

More than a century ago, the leading French alienists entertained the view that the primary cause of mental disorders was to be found in visceral changes. While this may not be entirely true, it is significant that even then, in comparatively primitive days of scientific investigation this view was held. In 1809 Pinel stated "It seems that the " primitive seat of insanity generally is in the " region of the stomach and intestine and it is from " that centre that the disorder of intelligence " propagates itself as if by a species of irradiation". This view probably arose from the fact that Pinel was one of the first to recognise the relationship between gastro-intestinal disorders and mental disorders.

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In 1875, Savage, an English alienist , reported cases of recovery from mental disorders after removal of infected teeth.

Probably the first scientific publication on the subject was made by William Hunter in 1900, who insisted on the role of chronic sepsis as an aetiological factor in diseases and advocated the necessity of antiseptic medicine, which he believed to be just as important as antiseptic surgery. In 1903 Dr. George Wilson emphasised the need of investigations of a general nature as to the reaction of the body to bacterial and other untoward influences. In his very interesting paper he cites two cases of mania in which he found post-morten signs of gastro-intestinal catarrh and dilatation of the stomach. Clouston in 1904 recognised the relationship between gastro-intestinal disturbances and insanity, especially melancholia. He stated that constipation and altered bowel contents in a direction pointing to imperfect digestion primary and secondary were present in 50% of cases as prodromata of various forms of insanity, and he believed that many cases of insanity were warded off by appropriate treatment of these gastrointestinal disorders, just as attacks of epilepsy were so prevented. In 1905 Edward Blake in his paper on "General Antisepsis in the Treatment of Neuro-Psychosis" after showing how two cases, one of stuperose insanity and another of epileptic erotomania, were so successfully treated, he concludes "that it is imperative/

imperative that we should close up all the lateral avenues which might conceivably lead to self infection; more especially by way of the cutaneous tract, alimentary canal, and by the genito-urinary apparatus. The fact cannot be too strongly emphasised that when toxins do not actually cause any given morbid state, they often serve to stereotype it."

About the same time Arthur A. Townsend published his work on Mental Depression and Melancholia considered in regard to Auto-intoxication. He deduces, and I think rightly, that many cases of melancholia are due to auto-intoxication resulting from the absorption of toxins derived from the alimentary tract. The symptomatology of this condition he states to be foul breath, coated tongue, indifference to or refusal of food, foul smelling stools, anaemia, sallow dirty skin, profuse perspiration, offensive odour, eruptions, disorders of sensation leading to flesh picking and headache.

Two years later Dr. Lewis Bruce published a paper on the Clinical Significance of Indoxyl in the Urine. According to Bruce, excess of indoxyl in the urine signifies a loaded alimentary tract and should be treated accordingly; the benefit being most obvious in those patients with symptoms of alimentary disturbances and toxaemia, as under such treatment indoxyl disappears from the urine.

Prior to 1907, most of the work which had been done in regard to chronic sepsis and auto-intoxication as an etiological factor in insanity, was done in relation/

relation to gastro-intestinal disorders. Very few observers had sought for other foci of infection. One of the first to recognise the significance of foci of infection arising in relation to the teeth, was Dr. Rayner working in the Out-patient Department of St.Thomas' Hospital amongst cases of incipient insanity. The first step in his method of treatment was to hand these cases over to the care of the dental surgeon, with a remarkable improvement in their condition. This point was also emphasised by G. Foster Barham in his treatment of epileptic insane, when he speaks of the removal of exciting causes, such as conditions of the alimentary tract and especially the condition of the teeth, which he says in most admitted cases is deplorable. Not only, he says, do the teeth show caries, but the gums are soft and in many cases in a condition of suppurative gingivitis, as well as alveolar abscesses, pyorrhoea alveolaris being present.

The next source of chronic infection to be investigated was that arising from the genito-urinary apparatus. C. J. Shaw in his paper on Amentia and Dementia in 1901 drew attention to the occurrence of Cystitis in asylums even in fairly healthy patients, the cystitis being associated with bacilli of the B.Coli type. Prunier, the French physician, in a contribution to the study of Auto-infection in Mental Confusion estimated the toxicity of the urine by injecting it into animals and observing the results,.

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He concludes that in most cases of confusional insanity there is present some gastro-intestinal disorder. Owing to an excessive production and absorption, the kidney is stimulated to further work so that there appears a hypertoxicity of the urine. But this method of defence is not equal to the production of toxins, so that auto-intoxication is produced and manifests itself in physical signs and mental confusion. By injecting this hypertoxic urine into animals, the animals died in convulsions, never in coma, and he attributes this to the ptomaines in the injected urine.

Lewis Bruce, after investigating the intestinal flora, goes so far as to say that the disease known as mania is due to a bacterial toxaemia.

In a paper by Mervyn A. Archdale he emphasises a point which I consider one of the most important in the detection of chronic sepsis when he says that we can have bacterial invasion of a part and absorption of toxins without any noticeable local signs. Oral sepsis, he says, aggravates mental symptoms and calls for urgent treatment and in some cases has been a most important cause of insanity. As for cystitis, he very rightly says we may have a bacteriuria and not know it until the urine is examined; and again because one is so apt to be misled by the state of the bowels, because it is most important to have a full knowledge of the state of the bowels, one should see the motion every day. Personally,

Personally, I would go further than that and say that not until a complete chemical and bacteriological examination of the stool has been carried out, is one justified in saying that one has a complete knowledge of the intestinal tract and its contents.

In 1910 Carlisle Howard reported a case of mania with confusion, in which he found that the urine contained streptococci which the serum agglutin: -ated in twenty minutes in a one in forty dilution and the stools contained an abundant growth of streptococci. Again Barton White while investigating the urine in cases of general paralysis of the insane, was struck by the high percentage of cases in which he found a bacteriuria and he deduced that they might possibly be carried by the blood stream from an infected focus or possibly from the alimentary canal.

Mercier in his paper on Diet as a factor in Mental Disease lays stress on the fact that diet plays a greater role in mental disorders than was commonly thought. Such a dietary as one rich in carbohydrate and poor in protein having a deleterious effect. Chalmers Watson commenting on this paper points out that diet influences to a great extent the flora of the intestine and thus shows that Mercier's views have a wider significance. Another point which might be added is the fact that such an ill-balanced diet renders the patient less able to withstand bacterial invasion and thus a vicious circle is set up.

In his paper on melancholia of the involutional period, W.F. Menzies brings out the point/

point emphasised by G. M. Wilson in 1903 of the enlargement of the colon and atrophy of its walls. Also he notes the excessive putrefaction in the intestine in such cases.

Much work has been done along collateral lines in attempting to investigate the effects of chronic sepsis. The relationship between toxaemic conditions and insufficiency of the endocrine glands notably the thyroid and adrenals was investigated by Guy A. P. Prier. The relationship between toxaemic conditions and acidosis was noted by B. H. Shaw, who found in twenty-five cases of insanity that ten suffered from acidosis, all of which were of the confusional type, and with improvement in their condition there was a diminution in the acidosis.

More recently there are four investigators who have done much to put the study of chronic sepsis in relationship to insanity on a scientific basis. Goodall, who has done a great deal of work on the subject, was one of the first to apply the use of X-ray examination of bismuth meals to cases of dementia praecox, with a view to discovering delay in the passage of intestinal contents. Mention must be made of the pioneer work of Ford Robertson on the subject. In his book on Therapeutic Immunisation, in which he pays special attention to asylum practice, he emphasises the toxic element especially in the acute confusional insanities, manic-depressive insanity, and dementia praecox. The/

The work of Chalmers Watson, who for many years has taught the importance of chronic foci of infection in many general diseases and more recently in insanity, is worthy of special mention. His painstaking researches into methods of examination, clinical and bacteriological, his discovery of the saccharose milk agar, and his methods of treatment, give him a prominent place in the ranks of original investigators. More recently much work has been done by Henry A. Cotton of Trenton, New Jersey, who carries out most thoroughly the investigation and treatment of chronic foci of infection in cases suffering from mental disorders. For the diagnosis and treatment he enlists the aid of the specialists in the various branches of medicine and surgery. This method of procedure, namely consulting with specialists, is in my opinion of extreme importance, as many cases of latent disease in various organs would pass unnoticed by anyone but an expert observer.

It is difficult to say definitely how far toxic processes play a part in the causation of certain varieties of insanity. As will be seen later, there are many cases where, when a definite focus of infection has been found and treated no great improvement ensued; cases where on removal of a septic focus the more acute signs subsided, but left in their train those indefinable signs of oncoming mental enfeeblement; cases where after treatment the attack of insanity quickly passed but re-appeared as bad as before; cases where months

elapsed/

elapsed between treatment and improvement, and finally cases where an apparent cure has ensued and has, up to the present time, been maintained.

Without entering into the role of heredity and the psychogenic factor in the causation of insanity, no clinical observer can lose sight of these all important factors when discussing the etiology and treatment of insanity. At first glance, it would seem obvious that a patient who has had, say abdominal sepsis from an inflamed appendix, severe pyorrhoea from infected teeth, gastritis or sinusitis and then becomes insane, that we should deduce the insanity to be caused by the disease in question. When however, we consider the fact that only a small proportion of people with these diseases break down mentally, we must look for some other factor - heredity, psychogenic, etc.

In how far then do these toxid processes play a part in the causation of insanity? Certainly, from my experience, I would say that in certain types of insanity they are very potent factors, especially in the manic-depressive and confusional cases. One can imagine these toxic bodies circulating in the body long before any mental symptoms appear, and when they do appear we may conclude that the immunity of the person is diminished, either due to physical or mental cause, or that the infection becomes more virulent and mental symptoms ensue. In very many cases of insanity a definite "cause" can be given to account for their trouble, e.g. bodily illness, influenza,/

influenza, fever, overwork, worry, climacteric, adolescence, etc. etc. Many of these so-called causes, in my opinion, simply serve as immediate causes undermining the vitality of the body, and allowing the toxins, especially from our point of view the neuro-toxins, greater scope. In these cases the insanity can only be considered as a symptom of the chronic infection of a neuro-toxic variety acting on the nerve cells.

Nowadays, it is laid down as a general principle that a very small focus of infection can cause serious disease with wide-spread symptoms, e.g. infection of the teeth in nephritis, infection of the throat in diptheria, etc. Alcohol plays somewhat an analogous part in the causation of insanity. It is quite an established fact that alcohol can give rise to certain well-known types of insanity, and yet we know that many people who take alcohol to great excess never suffer from mental disorder, but that does not prevent us from recognising alcohol as a definite aetiological factor. Such exactly, in my opinion, is the role of chronic foci of infection in its relation to insanity.

SOURCES OF INFECTION.

The teeth.

As previously mentioned, the teeth as a source of infection and as a cause of insanity, were recognised early by Savage, and more recently by Reyner, Chalmers Watson and Henry A. Cotton. In recent years the question of oral sepsis has been constantly before the medical practitioner in the treatment of many diseases such as anaemia, rheumatoid arthritis, nephritis, etc. Again in the treatment of diabetes with insulin, the state of the teeth requires most careful supervision, which seems to show that even a small focus of infection may upset the functions of the endocrine glands, and this upset becames obvious in insulin therapy. While these statements are practically universally accepted by the medical profession in the treatment of general diseases, such is not the case in the treatment of insanity, and yet, according to G. M. Robertson, the nervous system is most highly sensitive to the action of toxins.

Probably the best classification of infected and diseased teeth for our purpose, is that made by Henry A. Cotton. He divides them into the following groups:-

(1) Unerupted and impacted teeth especially third molars;

(2) Periapical granulomata;

(3) Carious teeth with infections;

(4) Apparently healthy teeth with periodontitis;

(5) Devitalised/

(5) Devitalised teeth with crowns;

(6) Filled teeth with root infections;

(7) Gingival granulomata in apparently vital teeth.

All these conditions are easily diagnosed by the trained observer, and when the investigation is supplemented by X-ray examination, no focus of infection can remain hidden. From the work of others and from my own experience I strongly urge that in all cases showing signs of a general toxaemic condition, the teeth should be examined and appropriately treated. It is often remarkable how few extractions have to be made to render the mouth in a healthy condition. All teeth showing advanced decay should be extracted. The apparently sound teeth which show apical infection, and extensively filled teeth with root infection should also be sacrificed. This also applies to unerupted and impacted molars, especially in young subjects.

Infected teeth may be said to have a deleterious effect on the body in one of two ways. Firstly, by absorption of toxic products directly from the septic focus and secondly, indirectly, due to the swallowing of infected material from the mouth causing a secondary infection of the gastro-intestinal tract, by a long continued action.

Pyorrhoea alveolaris is not such a potent cause of septic absorption as may at first be thought, owing to the fact that there is usually fairly free drainage from the septic area and again as to the

swallowed/

swallowed pus we must rely to a certain extent on the antiseptic action of the gastric juice to neutralise the effects of the septic material. This does not mean that pyorrhoea alveolaris should not be vigorously treated, as there is no doubt that the living organisms can obtain a foot-hold in the gastro-intestinal tract, should there be any diminution in the acidity of the gastric juice. By far the greatest stress must be laid on the apical infection and on the infection of unerupted and impacted molars, and these can only be diagnosed efficiently with the aid of an expert. No less an authority than Sir Thomas Horder says "Deepseated toxic processes are " often dependent on non-suppurating infections when " the nidus of the micro-organisms is in close " contact with the blood-stream, as at the roots of " the teeth."

Rosanof and his co-workers have emphasised the selective action of bacteria on certain tissues and this has been borne out by the clinical observations of G.M. Robertson in his cases of aural suppuration in a number of cases during an epidemic of influenza. Cases of neuritisand neuralgia also bear out these statements as it is well known how often a dramatic cure results from the removal of an infected focus, usually the teeth.

The striking features of Cotton's work emphasises the point. Since 1915 he has treated cases of insanity from this standpoint, and he has discharged 87% of admissions as either "Cured" or "Improved"/

"Improved" in comparison with 42% prior to 1915. Very recently W.R. Ackland published three cases of non-certifiable mental impairment in which there was marked evidence of septic absorption from the teeth and which mental impairment cleared up remarkably quickly after appropriate treatment. One of the commonest causes of failure to get results depe nds on the fact that infected and necrotic bone is left behind, and absorption of toxins is continued even after removal of the teeth.

For the bacteriological examination of the teeth, many methods have been advocated. After many trials and conflicting results the best method, in my opinion, is as follows:- The tooth to be removed is carefully selected and the gums swabbed with hydrogen peroxide. Without injecting any local anaesthetic, the tooth is quickly extracted and without removing the tooth from the forceps, a smear is made on a suitable medium. This is cultured anaerobically as well as aerobically. From these cultures the organisms are identified and vaccines made. If, instead of this procedure, the extracted tooth is placed into a broth culture tube and a plate inoculated from the broth, the organisms in the carious cavities also infect the medium and give very conflicting results - in fact the real causal organisms may be overgrown by the organisms in these cavities, which may have only entered the mouth with the last meal.

In examining the pus from the gums in

pyorrhoea/

pyorrhea alveolaris the best method, in my opinion, is to swab the gums and lips gently with hydrogen peroxide soaked in a sterile swab. Another sterile swab is now used to express a bead of pus from the gums, which is picked up by means of a sterile loop and transferred to a culture plate or tube.

The next point to be considered is what are the varieties of organisms which are found in these conditions? The commonest organisms found in pyorrhea alveolaris are staphylococcus aureus and streptococcus pyogenes and from infected teeth the commonest are streptococcus anginosus, streptococcus viridans, and streptococcus mitis. The relationship of oral bacterial to the flora of the stomach and bowel will be discussed later. In a series of cases examined by the above methods, I found the following results: in 56 cases with infection of the teeth and gums I found streptococcus pyogenes and streptococcus viridans in 42 cases; streptococcus mitis in 14 cases, and staphylococcus aureus in all cases.

Tonsils.

Much that has been said above also applies to chronic infection of the tonsils, and the patient may or may not have suffered from an acute infection of the tonsillar glands. The importance of the tonsil as a site of infection is now held to be of great importance in the treatment of general medical diseases and more recently in the treatment of insanity. It is a remarkable fact, how, that in the majority/

majority of cases, infection of the tonsils and the teeth exist pari passu. The importance of tonsillar infection has no doubt been over-rated to a certain extent, and these glands have been too frequently removed without thorough enough investigation as to their role in the causation of disease. But, there is no doubt whatever that after their removal, many cases of neurasthenia, nervousness, etc., clear up mentally, and improve physically. It is extremely difficult, sometimes, to diagnose tonsillar infection owing to the fact that organisms may lurk in the deep crypts and escape detection. It is not until the tonsils have been enucleated and examined bacterio-:logically and histologically that definite evidence of infection is forthcoming. The symptomatology of chronic infection of the tonsils is very variable. The symptoms and signs depend greatly on the amount of hypertrophy present, and also on the presence of adenoid vegetations which are commonly associated. When both conditions are present, respiration is interfered with and the patient becomes a mouth breather. The voice is affected and a dry cough may be present. There is increased liability to "Sore throat" and the cervical lymph glands are often enlarged. In well-marked cases the tonsils project into the mouth and may even be so extreme as to meet in mid-line. In some cases, however, the tonsils do not seem to be enlarged and this is called the "Buried" variety. In other cases of chronic lacunar tonsilitis cheesy matter is seen in the crypts of the tonsils and can be frequently expressed as/

as white particles, which have a very offensive smell and taste.

Probably the best method of examining the tonsil from a bacteriological point of view is as follows:-

A. After enucleation. Immediately after enucleation the tonsil is plunged into a dish of actively boiling saline and held there for at least ten seconds. This procedure gets rid of any surface infection and ensures the purity of the deep cultures from the tonsillar crypts. From these crypts a small amount of white substance is expressed and a smear made on a culture plate in the usual way.

B. Before enucleation. The mouth is first well rinsed with a weak solution of tincture of iodine and then the tonsil is swabbed with a sterile swab soaked in hydrogen peroxide. This latter procedure gets rid of the mucus on the surface of the tonsil. With another sterile swab, rub the surface of the tonsil with sufficient force to get a scraping of the surface epithelium. A smear is made on to a culture plate in the same way.

The commonest types of organisms found in this way are staphylococcus aureus, streptococcus pyogenes, pneumococcus haemolyticus and micrococcus catarrhalis.

In 26 cases of infection of the tonsil I found streptococcus pyogenes in all the cases, pneumococcus haemolyticus in five cases, and micrococcus catarrhalis in seven cases.

Naso-pharynx.

The naso-pharynx is a very common site of chronic infection and is very prone to break down the defences of the body. It is a very potent cause of infection of the gastro-intestinal tract, giving rise to gastro-intestinal catarrh. This chronic post-nasal catarrh is very common after influenza and this arising after influenza is, in my opinion, a most important factor in the causation of insanity by influenza. The symptomatology of this condition can be very slight, varying from a mere feeling of discomfort at the back of the throat, to attacks of pain, temperature and expectoration of pus. Very frequently, in fact often the only symptom, is a constant desire to clear the throat by drawing back through the nose which is followed by a viscid expectoration. On examination, the mucous membrane may be rugose, mucus and muco-pus adhering to the walls of the naso-pharynx. It is especially with these mild cases of chronic infection, so difficult to diagnose, that we are concerned. Very many cases of chronic post-nasal catarrh, especially of the influenzal form, have never had an acute attack of the disease. The characteristic syndrome of symptoms is: (1) a more or less constant watery discharge from the nose; (2) repeated colds, (3) general symptoms of drowsiness, joint and muscular pains, rise of temperature and (4) nervous symptoms, e.g. asthma, depression, headache, insomnia, gripping sensations in the head, neuralgic and rheumatic/

rheumatic pains. In these cases the Bacillus Influenzæ is not alone present but other organisms also.

The method of taking a swab of the naso-pharynx is as follows:-

After rinsing out the mouth with an antiseptic solution a sterile swab is used to wipe away any mucus from the surface of the naso-pharynx. A second swab is now used to remove the catarrhal exudate from the surface and culture plates inoculated from this.

The organisms found vary greatly in type and number, the infections being invariably of a mixed type, the commonest prevailing organisms being strepto-coccus pyogenes, anginosus and faecalis haemolyticus, staphylococcus aureus, pneumococcus, micrococcus catarrhalis, bacillus influenzæ and bacillus proteus.

In 14 cases of infection of the naso-pharynx I found a streptococcus, pneumococcus and micro-coccus catarrhalis in all cases and along with these the bacillus influenzae in 4 cases.

Accdssory Sinuses.

The maxillary, frontal, ethmoidal and sphenoidal sinuses may be attacked by bacteria in the course of acute or chronic infections of the nasal passages. Of these the maxillary sinuses are probably the commonest to be involved, in fact it is said that 2% of normal people suffer from chronic sinus inflammation. Owing to thickening of the mucosa and defective drainage, septic absorption is very liable to take place. The ways in which this may take place are:-

(1) By lymphatic absorption into the cranial sinuses especially from the ethmoidal sinus;

(2) Directly into the blood stream;

or (3) By swallowed septic material from the gastro-intestinal tract.

Amongst the symptoms which these patients complain of, one of the commonest is headache. It may not be present every day, but the condition may be present intermittently for years. The cause of the headache may be (1) Swelling of the mucous membrane and pressure on the nerves; (2) Swollen surfaces pressing on each other; (3) Stasis due to defective drainage; (4) Disturbance of the circulation of blood and lymph at the base of the brain, or lastly, but probably most important of all, the re-absorption of toxins from the infected sinus. Other symptoms are, purulent discharge from the nose, infraorbital pain and feeling of constantly swallowing "something"

from/

from the nose.

Another symptom is the presence of an offensive odour in the nose which is accentuated by sniffing. I have never seen a case in which hallucinations of smell had for their basis a sinus suppuration, but it is well within the bounds of possibility that such could arise. The ordinary methods of examination for suspected cases were used, e.g., posture test, proof puncture and the trans-illumination method.

A point which I have found to be of great diagnostic as well as therapeutic importance is, that after spraying the mucosa of the nose with adrenalin and following with an inhalation of steam, that the headache disappears then in all probability it is due to sinus infection.

In examining the pus from these sinuses, it is most important that it should be cultivated anaerobically as well as aerobically. The infection is invariably of a very mixed nature, the commonest types being strepto-coccus pyogenes, anginosus, staphylococcus aureus, staphylococcus mannite fermenters and non-fermenters, micrococcus catarrhalis, pneumococcus and diptheroids.

In two cases of infection of the maxillary sinus I found streptococcus pyogenes, pneumococcus and micrococcus catarrhalis.

The Urine.

As stated before C. J. Shaw drew attention to the frequency of cystitis in fairly healthy people and Archdale has stated that we may have a bacteriuria and not recognise it till we have examined the urine, the resulting cystitis being so slight as to escape notice. From my own investigations I can testify as to these statements and I believe that chronic infections of the urinary tract have a definite aetiological significance in insanity. The nature of the bacteriuria can only be understood by an investigation of the concomitant urinary findings, e.g., albumin, catarrh cells, pus cells, red blood cells, oxalate crystals, etc. etc. The ways in which the urinary tract may become infected are (1) from without, i.e. from prepuce or vulva; (2) direct extension from neighbouring viscera especially in the case of B. Coli infections and (3) blood infection.

The symptomatology of this condition is like all other chronic infections, extremely variable. There may be no symptoms whatever or there may be general malaise, elevations of temperature with frequency of micturition.

There are various methods advocated for the taking of the specimen of urine. The best methods I have found by experience to be as follows, viz., in females a catheter specimen taken, with all aseptic precautions, whereas in men all that is necessary is a mid-stream specimen.

The /

The commonest types of organisms found are Streptococci of various kinds, Staphylococci, Grampositive and Gramnegative diplococci, Bacillus coli and aerobic and anaerobic diptheroids.

In 25 cases in which the urine contained organisms I found diptheroid bacilli aerobic and anaerobic in twelve cases, gonococci in two cases, streptococcus pyogenes and staphylococcus in 11 cases.

Intestinal Tract.

There is no doubt whatever but that the intestinal tract is a very important and common site of chronic focal sepsis. This has long been recognised as an etiological factor not only in general diseases but also in insanity. It is easy to understand why the bowel should be the site of many lesions and a source of chronic infection. Consider the anatomy of the intestine. Its long and sinuous course tends to cause in certain people a sluggish action with retention of its contents. These retained contents then give rise to definite pathological lesions of the mucus membrane, which, being thus damaged, loses its selective capacity and consequently the toxic products are absorbed. It is important to note that intestinal stasis per se does not necessarily mean intestinal toxaemia; but sooner or later lesions arise which make way for toxic absorption and set up a very definite clinical picture.

Take, for example, that exceedingly common disease mucus colitis. Dr. Goodhart says of it, "It is an exceedingly common complaint and I believe "that no one can study it without coming to the "conclusion that it is more of the nature of an "abdominal neurosis than it is of any real disease "of the mucous membrane of the bowel".

The features which lead us to classify this disease as a neurosis are firstly, that the subjects are of a neurotic type and the disease often present/

present amongst the general symptoms of neurasthenia and it is commonest among brain workers.

There are three factors which seem to conduce to its development; (1) nervous temperament; (2) chronic constipation and (3) a period of prolonged mental stress. It pursues a courseirrespective of the food taken, and varies with the general health; lying dormant when the body tone is good, only to break out with renewed fury at the first sign of physical or mental depression. There is a constant apprehension and a fear of having an attack of diarrhoea, especially when the patient changes his or her surroundings. This, in association with its scorn of dieting, its resistance to all locally acting drugs and its failure to produce permanent signs in some cases, proclaims its functional nature. In many cases, however, there are definite pathological findings. In 1907 Lockhart Mummery published a series of 30 cases of colitis in which he found definite evidence of catarrh of the mucous membranes. The stools vary in consistency and nature, from constip: -ated motions streaked with mucus, to fluid stools containing jelly-like masses of mucus. The occurrence of attacks of sub-acute appendicitis are common in this condition.

Now, with the exception of the work of Lockhart Mummery, the whole argument is in favour of mucous colitis being a purely functional disease, and therefore a symptom instead of a cause of the usual/

usual accompanying mental symptoms. This I consider to be quite wrong. I can illustrate it by a series of cases seen in 1918 during a small epidemic of a disease in which pyrexia, diarrhoea and prostration were the most prominent signs. Two female patients recovered from the acute stage of the disease but have since suffered attacks of mucous colitis associated with mental depression. The stools are usually fairly well formed and contain a certain amount of mucus. The important point is the relation of the mental depression to these attacks of colitis. In both cases the patients would be feeling quite well and then would have an attack of diarrhoea and slight pyrexia which was followed, some time later, by mental depression. I have since noticed this to be the usual course of events, viz: first, the colitis followed by the nervous depression. While recognising the effect of the emotions on the internal organs I consider the symptomatology of this condition to be purely toxic in nature, viz., the latent disease, the lowering of body resistance, the increased virulence of the bacteria, and the absorption of bacterial products followed by the states of neurasthenia and mental depression.

The importance of chronic inflammation of the appendix as a source of auto-intoxication may be considered here. From personal experience of at least fifty cases of chronic appendicitis, I have come to the conclusion as to its etiological character in the causation of mental disorder. These cases/

cases invariably give a long standing history of syptoms; feeling out of sorts, headaches, lassitude, disinclination for work or play, inability to concentrate and mental depression. Associated with these symptoms were various sub-acute exacerbations of the local condition until the patients were advised to have their appendices removed. The appendix in all cases showed catarrh of the mucous membrane and many cases showed "kinks", cicatrices and impacted faecal concretions. After recovery from the operation the general health greatly improved and the lassitude and depression cleared up pari passu with the improved physical condition. The question arises as to whether the improvement was due to the removal of the appendix eradicating a focus of infection or whether the removal of the appendix and its limiting bands permitted of the more rapid passage of bowel contents and thus effectively got rid of intestinal stasis, putrefaction and auto-intoxication.

Before operation these doubtful cases were all X-rayed with a barium meal and without exception showed marked delay at the ileo caecal valve, hepatic and splemic flexures, and stasis of the large intestine. Now one of the most prominent symptoms of these cases was chronic constipation. Andrew Russel, talking of the nervous phenomena of habitual constipation, says that the symptoms differ widely in character and intensity. The mildest of these are depression and langour which gives place

to/

to brightness after a free evacuation only to return again with the constipation. It may be said that very many people are habitually constipated without the appearance of those nervous phenomena but that objection can easily be waived by the knowledge of the fact that there are great inherent differences in the sensitiveness of the nervous system of individuals. The difference in sensitiveness in response to exogenous influences is a fact which must always be borne in mind.

METHODS OF EXAMINATION.

1. Radiography.

II. Clinical Examination of Abdomen.

III. Bacteriological Examination of bowel contents.

Radiography. This method is undoubtedly one of the most valuable we have for examining the state of the intestinal tract. Unfortunately I was unable to carry out this method of investigation in the cases of mental disorders *per se* but in the investigation of a number of cases of neurasthenia in general hospital work, one was struck with the following findings, some of which were present in every case.

1. Ptosis of the stomach.
2. Delay in emptying of the stomach.
3. Delay in passage of barium meal the ileo-caecal valve.
4. Marked ptosis and stasis of the large bowel.

In these cases one was also struck by the fact that the stools were very evil-smelling and showed unmistakable signs of putrefaction. On being operated upon some of these cases showed marked chronic /

chronic inflammation of the appendix and distension and lack of tone of the large bowel. Two of the cases died from inter-current infection and at the post-mortem they showed distension and thinning of the wall of the large bowel, catarrh and atrophy of the mucous membrane. It must be remembered that intestinal stasis is not synonymous with intestinal toxaemia but sooner or later lesions, however small, occur in the mucous membrane. These lesions pave the way for the absopption of toxic products which give rise to the clinical picture in which mental symptoms are prominent. This has also been shown by studies of the Coliform Bacillus. While this bacillus is nominally saphrophytic, it is also facultatively pathogenic and pyogenic as has been seen by agglutination reactions of the blood serum. As long as the mucosa is intact the bacilli act as saprophytes but certain factors allow the penetration of the bacilli through the intestinal wall and in consequence they assume their pathogenic properties. These factors seem to be:

1. An increase in the number of bacteria, brought about by constipation, atony and by excessive carbohydrate feeding.

2. An increase in the virulence of the bacteria.

3. A weakening of the intestinal walls by previous catarrh, chills, errors of diet, areas of devitalisation and previous infections.

4. Direct traumata by foreign bodies, constipated faeces and intestinal sand.

Clinical Examination.

The patient usually gives a long history of complaints/

complaints. They complain of feeling out of sorts, headaches, lassitude, disinclination for work or play: tasks that used to be easy are only carried out with difficulty; inability to concentrate and mental depression. It is very much more common for us to meet with cases associated with mental depression than with mental excitement, as very few cases complain of feeling too well or too happy. On examination, we find that these cases suffer from a foul breath, coated tongue and an indifference sometimes amounting to refusal of food. They have a sallow, dirty and pigmented skin, on which there may be eruptions, and they suffer from profuse perspiration with an offensive odour. The stools are usually rather soft, pale and foul smelling, due to delayed evacutaion permitting of putrefactive changes of the bowel contents chiefly resulting from the activities of the proteolytic and putrefactive anaerobic bacteria. There may be degenerative changes in the essential cell structures of the body in for example, the liver, kidney and pancreas; the breasts show atrophy, become hard and knobby with cystic degeneration. On account of the profuse perspiration the temperature may be subnormal, but associated with this there are usually occasional slight rises of temperature due to septic absorption. There is wasting of the subcutaneous fat and with the premature appearance of senility, the hair becomes thin and grey. From these signs and symptoms it is easy to deduce that the whole process of metabolism is dis-:organised and that katabolism is proceeding at a much more rapid rate than anabolism.

One/

organisms can flourish anaerobically as well as aerobically; in other words which are facultative anaerobes.

The organisms usually found are Pneumococcus, Streptococcus pyogenes, Streptococcus anginosus, Staphyloccus of various kinds, Freidlander's pneumobacillus, Influenza bacillus, Micrococcus catarrhalis, Diptheroids, especially anaerobic and Streptothrix.

The diptheroids particularly the anaerobic forms are of great importance as they are highly neuro toxic.

In 48 cases I found Streptococcus pyogenes, Streptococcus mitis, and streptococcus faecalis associated with staphylococcus aureus and albus in 36 cases, diptheroids aerobic and anaerobic in 10 cases and pneumococcus haemolyticus in 2 cases.

One examination of the abdomen, often very little can be made out. There may be some distension of the abdomen, and weakness of the muscularity of the wall is easily ascertained. There may be tenderness on palpation especially in the right lower quadrant and gurgling in the caecum may be elicited. Associated with the tenderness there may be a slight degree of rigidity of the recti muscles. These signs, that is tenderness, slight rigidity and fullness of the caecum, may be present even after the ingestion of cathartics.

Bacteriological Examination.

The bacteriological examination of the bowel contents, like the bacteriological examination of other foci of infection, may give rise to very conflicting results if not carried out very carefully. It would be impossible to make a culture from the stool direct owing to the large numbers of organisms present which would in all probability cause such an overgrowth, especially of saprophytic bacteria as to prevent the development of the pathogenic organisms. The method which gives the most successful results is to give the patient a purgative, castor oil being the best, and after the bowels have emptied, to wash out the colon with plain sterile water and to collect the washings out of the colon in a sterile dish. A loopful of this may then be used to inoculate the culture plates and tubes. It is of extreme importance to cultivate the organisms both anaerobically as well as aerobically as many of the organisms are anaerobes. Also it shows what

organisms /

Indicanuria.

The substance in the urine which has received the name of indoxyl sulphate of potassium in which form it appears in the urine, is colourless but when strong oxidising agents are added to the urine it decomposes and indigo is set free. It is derived from indol, a product formed in the intestine by the decomposition of albumen under the influence of bacteria. When absorbed it is oxidised to indoxyl which combines with potassium sulphate to form indican. As to its significance in intestinal auto-intoxication, the results are most conflicting. Barr found it only in 32 out of 2,092 cases, and in these the symptoms did not suggest auto-intoxication. We must remember that the function of indican is a defence mechanism: the toxic indol being converted to an innocuous etherial sulphate. Interference with absorption of proteins will lead to increased putrefaction with a consequent increase of indican in the urine. Now indol is a highly toxic substance and when injected repeatedly into animals causes loss of weight. In man the taking of considerable amounts causes headache, irritability, insomnia, and confusion with increased liability to physical and nervous fatigue and if prolonged may lead to severe mental disorder. Harte found it in 32 cases. He concluded that, while indol is not a highly toxic substance, patients with persistent strong indican reaction invariably suffer from nervous or dyspeptic symptoms. Indican disappears from the urine/

urine on standing. The urine must therefore be examined fresh. Consequently, indicanuria is at best a fallacious guide to the diagnosis of auto-intoxication from the bowel, but its persistent recurrence is certainly an indication for a thorough examination of the gastro-intestinal tract.

Gastro-intestinal disorders.

As stated above Pinel held the view that the primitive seat of the trouble was in the region of the stomach and intestine. This view was probably due to the fact that he was among the first to note the relationship between gastro-intestinal disorders and mental disorder. Again, Mercier in his paper on "Diet as a Factor of Insanity" emphasised the fact that a diet relatively rich in carbohydrate and poor in protein played a part in the causation of insanity. Dr. George Wilson and T. S. Clouston both noted the relationship between catarrh of the gastric mucous-membrane and insanity, especially melancholia. In my own experience I have met with a fair percentage of cases in which gastric catarrh or gastritis seemed to be a definite etiological factor. The type of history one meets with is usually in men who have heavy manual labour to do, and instead of having a proper mid-day meal, have to be content with bread and tea. The history is that they have suffered from gastric symptoms for years in periodic attacks and recently the attacks have been more frequent and severe./

severe. The attack previous to admission is the worst of all and appears to the patient and his friends to be the most definite etiological factor. This gastric condition is invariably associated with carious teeth, with deficient molars causing deficiant masticatinn and septic gums. The continual swallowing of septic material seems to have a deleterious effect on the gastric mucosa and sets up a gastrointestinal catarrh. The question of the antiseptic action of the gastric juice must be considered. In my own experience by estimating the acidity with the Ewaldt Test meal, I have found to be reduced both total and free acidity. In fact in a few of the cases I found it to be very much reduced even in cases which gave symptoms of ulceration of the stomach. This is not always found as will be mentioned later. The next point to be considered is the relationship between oral, gastric and the intestinal flora. In my own cases I have found a very definite relationship in a few cases, in others, no relationship. In these few, I could detect the same type of organism in the teeth and the pus of the gums, in the contents of the stomach, and in the intestinal flora. Further, in these cases even after the usual treatment of the bowel, I could isolate a few of the organisms but on stopping the treatment the growth became profuse again. Further, by removing the teeth, giving acid tonics for the gastric condition and washing out the bowel, certain pathogenic bacteria disappeared and on ceasing the treatment no further growth of them could/

could be obtained. These facts, taken along with the fact that this was concomitant with the improvement of the patient's mental condition are indeed very significant. Usually in these cases where there is a growth of bacteria in the stomach there is a concomitant reduction in the free H.C.L. content of the test meal. Colon bacilli, streptococci and staphylococci were the commonest types to be found. The percentage of patients with a gastric infection is comparatively small in my experience as will be seen by the findings enumerated below.

The symptoms of gastric mischief are extremely variable but probably the commonest are, pain and discomfort, the time and site of these varying in different cases, nausea and the vomiting of frothy foul-smelling fermenting turbid fluid. The types of bacteria which I have found to be predominant in these cases are pneumococcus, streptococcus mitis, streptococcus pyogenes, staphylococcus aureus, streptococcus equinus and the colon bacillus.

The Blood.

1. Bacteriological Examination.
2. Cytological Examination.

Bacteriological Examination.

One would, at first glance, imagine that bacteria would be found in the blood in some of the types of mental disorder which are attributed to the result of chronic sepsis. In my experience, however,/

however, I have never yet found bacteria in the blood in the cases which I have investigated. Probably in these rare cases of acute delirious mania, organisms may be found in the blood, but in other types of insanity it is very unusual. Dide and Sacqubpée have described bacteria in the blood in 17out of 20 cases of Dementia praecox but of these results Goodall states, "It is obvious that such an "observation cannot impress us without confirmation "and critical examination. Only in one recent case "did I find organisms by the ordinary method. The "patient, a case of agitated melancholia who "developed pneumonia a few days after admission, and "who subsequently died showed a growth of pneumococci "in the blood."

Kozowsky, in a paper on the pathology of acute delirium states that staphlyococci, diplococci and influenza bacilli, have all been found.

The method which I adopted in attempting to demonstrate bacteria in the blood was as follows, viz: 10 c.c. of blood were withdrawn from the median basilic vein under the most stringent aseptic conditions, and immediately transferred to 40 c.c. of bouillon the whole then being placed in an incubator at 37°C. After 12, 24 and 36 hours loopfuls of the mixture were used to inoculate culture plates of agar, haemoglobin agar and serum agar, but in no case was there a resulting growth.

(2). Cytological Examination.

A study of the cytology of the blood in cases /

cases of mental disorder in which there is a possibility of absorption of septic products is very interesting and instructive. According to Lewis Bruce, cases of acute confusional insanity present a fairly well-marked polymorphonuclear leucocytosis and an eosinophilia, cases of the manic-depresssive psychoses and dementia praecox show variation in the leucocytic formula resembling the acute confusional cases but that these changes are not so constant, cases of delusional insanity and of terminal dementia do not show a leucocytosis and lastly, a leucocytosis and an eosinophilia point to a good prognosis and the reverse to chronicity. Again, the benefits reported by various authors, following the induction of an aseptic abscess and the injection of nucleinate of soda both of which procedures result in a polymor-:phonuclear leucocytosis in mental disorders show that there is a very definite relationship between the cytology of the blood and the mental state of the patient.

I have found in a few cases of very severe acute toxic confusional insanity that instead of there being an increase in the number of polymorphonuclear leucocytes that there was a decrease. This seems to coincide with the presence of a leucopaenia in a very severe infection in a weak or debilitated person who is unable to react to the infection in the usual way, namely by a polymorphonuclear leucocytosis. In the main, I agree with the findings of Lewis Bruce, but as regards Dementia-praecos especially in early

cases, /

cases, I have found fairly constantly a lymphocytosis of the small lymphocyte type.

According to Henry A. Cotton, there is a secondary anaemia, a leucocytosis (sometimes a leucopenia) a relative lymphocytosis, in which the large lymphocytes form a fair percentage of the increase. He also describes a cell of a large lymphocyte type the outline of which is irregular in contour and whose cytoplasm has not the robin's-egg blue of the normal large lymphocyte, but has instead a peculiar grainy appearance. The nucleus is always irregular in contour and stained with a moderate degree of intensity. It is frequently cuboid or ovoid in shape with one flattened side which does not correspond to the shape of the cytoplasm, in other words is not due to the pressure of surrounding cells. The cytoplasm of these cells frequently exhibits vacuoles or acidophilic granules. He claims to have found this type of cell in every case of oral sepsis. In classifying 415 cases of oral sepsis he found that the average percentage of these cells was 8.75. Normally these cells may be found in small numbers but when the exceed 2% of the differential count, they may be regarded as a sign of oral sepsis. This work is extremely significant in that it permits of the diagnosis of oral sepsis when ordinary clinical methods fail. According to Toren these cells arise from irritation of the lymphatic system.

My own findings entirely agree with those of Cotton in that I have never failed to find these cells in varying numbers in cases of oral sepsis. Moreover,

I /

found that the number of these cells had no relation-:ship with the amount of oral sepsis. In fact, I found my highest percentage in a case in which the only focus of infection I could demonstrate was one impacted molar. On removal of the oral sepsis, these cells slowly disappear from the blood. These cells have been called "Cells of Turk".

CONCLUSION.

From what has been said and especially from the tables, there are certain very obvious conclusions to be drawn. In the manic-depressive psychoses it appears that chronic infection plays a considerable part in the etiology. How great the part played is very difficult to estimate, when one considers that this form of mental disorder is one which tends to recover when the patient is given the ordinary mental hospital routine treatment. The first principle in mental hospital routine treatment is to put the patient under the best possible conditions, and I think that by treating in a thorough and systematic manner any foci of infection that this end is attained much more quickly.

In the cases of confusional insanity I have no doubt as to the part played by these foci of infection. In my opinion the primary cause of this type of mental disorder is a bacterial invasion of the body and moreover this invasion in many cases is so powerful as to cause the death of the patient. If

If the patient can be tided over the dangerous stage of the illness and if this is followed by a thorough eradication of foci of infection, these cases practically always recover completely. Neurasthenia is another disorder which appears to react well to this method of treatment, but again this is a type of disease which, when treated by ordinary mental hospital routine, tends to recover. The results of cases of dementia praecox paranoia and paraphrenia are most disappointing. In my opinion, there is very little, if any, relationship between foci of chronic infection and these disorders. In a few cases of demential praecox the cases did improve slightly.

My results appear to be very poor when compared with those of Ford Robertson, Chalmers Watson and Cotton and especially the latter. Probably they were more fortunate or more discriminating in their selection of cases. With the exception of the manic-depressive and confusional groups, I selected those cases which had not improved or only improved slightly under the ordinary routine measures.

In conclusion, let me say that, in my opinion infection, as regards etiology, plays the whole part in confusional insanity, a large part in the manic-depressive group and an almost negligible part in dementia praecox paranoia and paraphrenia.

Mr. W. O. K. Aet. 46. Duration of attack:- 4 months.

No previous bodily or mental illnesses.

Diagnosis:- Melancholia.

Examination:- Complained of foul breath, loss of appetite, headache. Skin sallow and dirty.

Teeth:- 1 devitalized tooth with crown- upper molar. 1 filled tooth with root infection- upper molar.
Pyorrhea of gums round lower incisors. Streptococcus anginosus in pure culture from filled tooth.
Staphylococcus aureus, Streptococcus pyogenes from pyorrhea.

Stomach:- Total acidity 30. Free acidity 10.

Infection of Stomach:- Staph. aureus strep. pyogenes.

Faeces:- contained Staph. aureus.

Blood:- Leucocytes 12,480, Polymorph leucocytes 70% Cells of Turk 9%

Treatment:- Removal of diseased teeth, mouthwash of hydrogen peroxide and acid gastric mixture.

Progress:- Within three weeks of removal of teeth the gums healed, general condition improved and depression much less intense. The gastric fluid showed an increase of acidity. (Total acidity 58. Free acidity 18. There was a steady diminution of the leucocytosis and cells of Turk.

	Leucocytes.	Polymorph leucocytes.	Cells of Turk.
On admission	12,480	70%	9%
14 days later	9,672	69%	5%
1 month later	7,465	60%	3%
2 months later	7,400	65%	1%

There was gradual improvement until he was discharged "recovered" within three months of admission.

Mr. Wm. W. Aet. 42. Duration of attack:- 3 months.

No previous bodily or mental symptoms.

Diagnosis:- Melancholia.

Examination:- Complained of profuse perspiration, palpitation, headache and constipation. He had/

had occasional rises of temperature in the evening.

Teeth:- All lower incisors and molars showed root infection. Upper molars decayed. Pyorrhea of gums.

Infection of teeth and gums:- Strep. pyogenes. Strep. mitis; Staph. aureus.

Stomach:- Total acidity 36. Free acidity 12. No infection of stomach.

Faeces:- Staph. aureus. Strep. pyogenes.

Blood:- Leucocytes 15, 670. Polymorph Leucocytes 82% Cells of Turk 7%.

Urine:- Trace of albumin. No infection of bladder.

Treatment:-Removal of infected teeth. Mouth wash of hydrogen peroxide. Lavage of the colon with normal saline, boric acid solution and weak solution of potassium permanganate.

Progress:- One month later gums healed; gastric fluid showed increase of acidity (Total acidity 60, free acidity 22, the infection had disappeared from the bowel and the general as well as the mental condition of the patient had greatly improved. The leucocytes showed a steady decrease in number.

	Leucocytes.	Polymorph Leucocytes.	Cells of Turk.
On admission	15,670	82%	7%
1 month later	10,400	78%	2%
2 months later	8,640	72%	2%

He was discharge within two months from the date of admission, but a few days later returned as depressed as formerly. A vaccine which had been prepared from the infection of the teeth containing Strep. pyogenes, Strep mitis and Staph. aureus was administered. Under this treatment he again improved and was discharge "recovered" within three months from second admission.

Mr. Wm. B. Aet. 45. Duration of attack:- 7 days.

Previous bodily illnesses:- Attacks of indigestion for years which have become worse during past three weeks. No previous mental illness.

Diagnosis:- Melancholia.

Examination:-/

Examination:- Pale sallow complexion, moist dirty skin, foul breath.

Teeth:- Nil Abnormal.

Stomach:- Total acidity 21. Free acidity 0. Large quantity of test meal returned containing undigested foul smelling food. Lactic acid present.

Infection of Stomach:- Staph.Aureus, Strep. Equinus and Gram - ve diplococci.

Faeces:- Strep. equinus. Gram - ve diplococci.

Blood:- Leucocytes 8,240; Polymorph leucocytes 70% Cells of Turk 2%.

Treatment:- Daily wash out of stomach with weak solution of potassium permanganate. Acid gastric mixture. Milk diet for two weeks. One month later mental condition much improved. No bacterial growth from stomach contents - digestion much improved - total acidity 41; Free 9. Two months later - on ordinary diet - faeces free from strep. equinus - total acidity 56 - Free acidity 16. Within three months from admission discharged "recovered".

Mr. J. McH. Aet. 21. Duration of attack 6 days.

No previous bodily or mental illnesses.

Diagnosis:- Mania.

Examination:- In good condition physically.

Teeth:- Excellent.

Stomach:- Total acidity 42; Free acidity 7. No infection of stomach.

Faeces: Contained streptococcus pyogenes, streptococcus faecalis, streptococcus anginosus.

Blood:- Leucocytes 13, 640. Polymorph Leucocytes 82% Cells of Turk - nil.

Treatment:- Colon lavage with normal saline, boric acid and potassium permanganate solutions alternately.

Progress:- In 14 days marked improvement of mental condition. One month later mental condition normal.

	Leucocytes.	Polymerph leucocytes.	Cells of Turk.
On admission	13,640	82%	
	9,830	70%	
	7,640	70%	

Discharged "recovered" within two months.

Mr. D. D. Aet. 22. Duration of attack 4 days.

No previous mental illnesses. Asthma and bronchitis for past three years, more severe before admission.

Diagnosis:- Mania.

Examination:- Typical adenoid facies - severe chronic bronchitis.

Teeth:- Caries of upper molars. Pyorrhea of gums. Streptococcus pyogenes and streptococcus anginosus from upper molar roots. Staphylococcus aureus from pus from pyorrhea.

Tonsil:- Chronic inflammation present. Infection of streptococcus pyogenes pneumococcus haemolyticus.

Naso-pharynx:- Infection of micrococcus catarrhalis; streptococcus pyogenes, stapylococcus aureus.

Lung:- Sputum contained, pneumococci, streptococci and micrococcus catarrhalis.

Blood:- Leucocytes 17,800; polymorph leucocytes 80% Cells of Turk 4%

Treatment:- Removal of bad teeth. Mouth- wash of hydrogen peroxide. Removal of tonsils and adenoids. Inhalations of menthol and tinc. benz. co.

Progress. One month later mental condition practically normal. Still a few bacteria in sputum but naso-pharynx clear.

	Leucocytes.	Polymorph leucocytes.	Cells of Turk.
On admission	17,800	80%	4%
1 month later	12,320	76%	3%
2 months later	7,430	70%	-

Discharged "recovered" two months after admission.

Mr. J. L. Aet. 24. Duration of attack:5 months

No previous bodily or mental illnesses.

Diagnosis:- Dementia praecox.

Examination:-In fair health. Constipation and occasinnal toothache.

Teeth:- 2 filled molars with root infection. Caries of lower incisors.
Pyorrhea of gums round lower incisors.

Infection:- Streptococcus anginosus, streptococcus pyogenes, staphylococcus aureus.

Stomach:- Total acidity 58. Free acidity 12. No infection of stomach.

Faeces:- Contained Streptococcus pyogenes, Staphylococcus aureus, anaerobic diptheroids.

Blood:- Leucocytes 7,240; Polymorph Leucocytes 70% Cells of Turk 3%

Urine:- Trace of albumin. Indican present. No infection of urine.

Treatment:- Pathological teeth extracted. Mouth wash of hydrogen peroxide. Colon lavage. Within a month organisms had disappeared from teeth, gums and faeces, but with no change in mental condition. A vaccine containing streptococcus pyogenes, staphylococcus aureus, and anaerobic diptheroids. The injection of this caused no local or general reaction. This treatment continued for six months with improvement in bodily condition but no change in mental condition.

Mr. R. D. Aet. 20. Duration of present attack:6 months. No previous bodily or mental illnesses.

Diagnosis:- Dementia praecox.

Examination:- Loss of weight, anaemia, constipation and foul smelling breath.

Teeth:- In good condition.

Stomach:- Total acidity 60; Free acidity 26. No infection of stomach.

Faeces:- Contained Streptococcus pyogenes and pneumoccus haemolyticus.

Urine:- Nil abnormal.

Blood:- Nil abnormal.

Treatment:- Lavage of the colon with normal saline, boric acid and potassium permanganate alternately. After six weeks treatment bowel cleared of streptococci and pneumococci but without improvement in mental condition. A vaccine containing strepto-coccus pyogenes and pneumococcus haemolyticus was given for 6 months without change in mental condition.

Mrs. S. Aet. 55. Duration:10 days. Appendicitis with discharging sinus for three weeks. No previous mental illnesses.

Diagnosis:- Confusional insanity.

Examination:-

Teeth etc:- Nil abnormal.

Discharging sinus:- Pure culture of bacillus coli.

Blood:- Leucocytes 20,320. Polymorph leucocytes 80%

Treatment:- Wound washed out with hydrogen peroxide. Bacillus coli vaccine administered for three months.
Complete recovery.

Miss J. D. Aet. 20. Duration: 7 days. No previous bodily or mental illnesses.

Diagnosis:- Confusional insanity.

Teeth:- Severe pyorrhea of gums. All lower molars very decayed.

Blood:- Leucocytes 21,630. Polymorph leucocytes, 82%
Cells of Turk 8%
No other focus of infection.

Treatment:- Teeth removed; mouth wash of hydrogen perioxide. In two weeks no infection of teeth or gums. Gums healed in one month.

	Leucocytes.	Polymorph leucocytes.	Cells of Turk.
On admission	21,630	82%	8%
1 month later	8,724	65%	2%

Discharged "recovered" three months from admission.

Mr. S. D. Aet. 27. Duration of attack: 2 years.

No previous bodily or mental illnesses.

Diagnosis:- Paraphrenia.

Examination:- Complained of foul breath - loss of of appetite and headache.

Teeth: Upper incisors show extensive caries. Pyorrhea of gums round incisors.

Infection:- Streptococcus mitis, pneumococcus haemolyticus, Staphylococcus aureus.

Stomach:- Total acidity 60; Free acidity 22. No infection of stomach.

Blood:- Leucocytes 9,730; Polymorph Leucocytes 75% Cells of Turk 4%.

No other focus of infection.

Treatment:- Infected teeth removed. Mouth wash of hydrogen peroxide. Within one month gums healed - no infection in teeth, but no change in mental condition.

	Leucocytes	Polymorph leucocytes.	Cells of Turk.
On admission	9,730	75%	4%
1 month later	7,640	69%	1%
2 months later	7,100	68%	0%

A vaccine containing Streptococcus mitis pneumococcus haemolyticus was administered for six months with no change in mental condition of patient.

Mr. S. McA. Aet. 32. Duration of attack: 17 months.

Sever pyorrhea and teeth removed 6 months before admission. No previous mental illnesses.

Examination:- In good health.

Teeth:- All artificial.

Stomach:- Total acidity 58; Free acidity 26. No infection of stomach.

Faeces:- Contain Streptococcus pyogenes, diptheroids.

Urine:- Trace of albumin. Gonococci on prostatic massage.

Treatment:-Colon lavage with solutions of normal saline, boric/

boric acid and potassium permanganate. Prostatic massage thrice weekly and daily wash out of urethra and bladder. Vaccines of gonococci, strepto-coccus pyogenes and diptheroids were given for a period of six months with no improvement on the mental condition.

	Leucocytes	Polymorph leucocytes.
On admission	8,760	70%
1 month later	7,640	68%
2 months later	7,100	66%
6 months later	7,240	67%

Mr. J.B. Aet. 39. Duration of attack: 17 months. Tuberculous disease of spine 16 years ago. No previous mental illnesses.

Diagnosis:- Paranoia

Examination:- Sallow dirty skin, foul breath, constipation.

Teeth:- Upper molars decayed and pyorrhea of gums.

Infection:- Streptococcus pyogenes, staphylococcus albus and aureus.

Stomach:- Total acidity 58; Free acidity 24; no infection of stomach.

Faeces:- Nil abnormal

Urine:- Nil abnormal

Blood:- Nil abnormal.

Treatment:- Teeth removed; mouth wash of hydrogen peroxide. Vaccine containing Streptococcus pyogenes, staphylococcus aureus given for a period of six months without improvement in mental condition of patient.

	Leucocytes.	Polymorph leucocytes.	Cells of Turk.
On admission	18,420	82%	6%
1 month later	16,420	80%	6%
2 months later	9,360	75%	-
6 months later	6,700	68%	-

Mr. S. F. Aet. 47. Duration of attack: 2 years.

No previous bodily or mental illnesses.

Diagnosis:- Paranoia.

Examination:- In fairly good health.

Teeth:- Upper molars and lower incisors show marked caries. Severe pyorrhea.

Infection:- Streptococcus pyogenes, staphylococcus aureus.

Stomach:- Total acidity 22. Free acidity 0

Infection:- Streptococcus pyogenes, G-+-diplococci

Faeces:- Contained Streplococcus pyogenes.

Urine:- Trace of albumin. Gonococci on prostatic massage.

Blood:- Leucocytes 15, 020. Polymorph leucocytes 80% Cells of Turk 8%

Treatment:- All septic teeth removed. Mouth wash of hydrogen peroxide. Acid gastric mixture and repeated gastric lavage with solution of potassium permanganate. Lavage of the colon with antiseptic solutions. Urinary antiseptics in the form of acid sodium phosphate and urotropin and daily lavage of the urethra and bladder with weak solution of potassium permanganate.

This treatment along with vaccines of streptococcus pyogenes and gonococci was continued for six months without behefit to the mental condition of the patient.

The gastric acidity increased in five weeks to total acidity 54 and free acidity 19. with a disappearance of organisms from the stomach.

Changes in blood:-

On admission	15,020	80%	8%
1 month later	12,640	76%	7%
2 months later	8,430	70%	3%
6 months later	6,420	70%	1%

Mr. Wm. W. Aet. 51. Duration of attack 4 months.

No previous mental or bodily illnesses.

Diagnosis:- Neurasthenia.

Examination:- Complaint of indigestion, constipation loss/

loss of weight and appetite.

Teeth:- In excellent condition.

Stomach:- Total acidity 42. Free acidity 6. No infection of stomach.

Faeces:- Contain aerobic and anaerobic diptheroid bacilli.

Urine:- Trace of albumin and aerobic diptheroid bacilli.

Blood:- Leucocytes 7, 240. Polymorph leucocytes 68%

Treatment and progress:- Colon lavage with weak solutions of potassium permanganate and hydrogen peroxide alternately. Acid sodium phosphate and urotropin given.
A vaccine was prepared containing aerobic and anaerobic diptheroid bacilli. The local treatment and the vaccine therapy was continued for three months. There was a complte disappearance of diptheroid bacilli from the faeces and urine. The mental condition at the same time cleared up completely and in three months from admission the patient was discharged.

Mr. R. G. Act. 44. Duration of attack: 6 months.

No previous bodily or mental illnesses.

Diagnosis:- Neurasthenia.

Examination:- In very poor physical health. Anaemia, loss of weight almost amounting to emaciation, loss of appetite, constipation.

Teeth:- Very marked caries of all the teeth. Severe pyorrhea of gums.

Infection:- Streptococcus pyogenes, pneumococcus haemolyticus, staphylococcus aureus.

Stomach:- Total acidity 30; Free acidity 0.

Infection:- Streptococcus faecalis and staphylococcus aureus.

Faeces:- Nil abnormal

Urine:- Nil abnormal

Blood:- Leucocytes 6, 940. Polymorph leucocytes 68% Cells of Turk 8%

Treatment. Removal of teeth and mouth wash of hydrogen/

hydrogen peroxi de. For the first ten days after removal of teeth the mental condition was very much worse, a slight rise of temperature every evening for twelve days, the leucocyte count rose to 12,640 with a polymorph leucocyte percentage of 80%. Within the next month there was a gradual improvement in the physical and mental condition. The leucocytes were reduced in number, the gastric acidity increased to total acidity 58, Free acidity 19, With a disappearance of organisms from the stomach. In two months there was a very remarkable improvement which culminated in complete recovery in three months from time of admission.

Change in blood count:-

	Leucocytes.	Polymorph leucocytes	Cells of Turk.
On admission	6,940	68%	8%
Two days after extraction of teeth	12,640	80%	9%
Ten days after extraction of teeth	9,530	76%	6%
1 month later	7,210	68%	-
2 months later	6,980	70%	-
3 months later	7,100	65%	-

The following tables illustrate the type of case, the sites of infection being marked with a X , while the duration of the patient's stay in the Institution is also noted.

Melancholia.

Foci of Infection .

	Sex.	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
1	M	46	-	X	-	X	X	-	-		Recovd.	2 months
2	M	42	-	X	-	X	X	-	-		"	7 "
3	M	45	-	-	-	X	X	-	-		"	4 "
4	M	43	-	X	-	X	X	-	-		"	5 "
5	M	39	-	X	-	-	-	-	-		"	12 "
6	M	22	-	X	X	-	-	-	-		"	4 "
7	M	44	-	X	-	-	-	-	-		"	14 "
8	M	45	-	X	-	-	-	-	X		"	4 "
9	M	51	-	-	-	-	X	-	-		"	9 "
10	M	25	-	X	X	-	-	-	-		"	6 "
11	F	25	-	-	-	-	X	-	X	-	"	2 "
12	F	36	-	X	-	-	-	-	-	-	"	12 "
13	F	25	-	-	-	-	-	-	X	-	"	5 "
14	F	30	-	X	-	X	-	-	-	-	"	3 "
15	F	43	-	X	X	X	X	-	-	-	"	14 "
16	F	33	-	X	-	X	X	-	-	-	"	4 "
17	F	42	-	-	-	-	-	-	X	-	"	16 "
18	F	41	-	X	X	-	-	X	-	-	Unimproved	
19	F	33	-	X	-	-	-	-	-	-	Unimproved	
20	F	51	-	-	-	X	X	-	-	-	Recovd.	6 "
21	F	52	-	-	-	-	-	-	X	X	Unimproved	
22	F	35	-	-	-	-	X	-	-	-	Recovd.	7 "
23	F	54	X	-	-	-	-	X	-	-	Unimproved	
24	F	21	-	X	-	-	-	-	-	-	Recovd.	4 "

	Sex.	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
25	F	34	-	X	-	-	-	-	-	-	Recovd.	6 months
26	F	41	-	-	-	-	X	-	X	-	"	8 "
27	F	48	-	X	-	-	-	-	-	-	"	10 "
28	F	21	-	X	X	-	-	-	-	-	"	3 "
29	F	51	-	-	-	-	-	-	X	X	"	14 "

Mania.

Foci of Infection.

	Sex.	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
1	M	22	X	X	X	-	-	X	-	-	Recovd.	6 "
2	M	18	-	-	-	-	X	-	X	-	"	4 "
3	M	43	-	X	-	-	-	-	-	-	"	5 "
4	M	30	-	-	-	-	X	-	-	-	Improved	
5	F	45	-	X	-	-	X	-	-	-	Slightly improved	
6	F	47	-	-	-	X	X	-	-	X	Died	
7	F	31	-	-	-	-	--	-	X	X	Recovered	10 "
8	F	25	-	-	-	-	-	-	X	-	Improved	
9	F	33	-	X	X	-	X	-	--	-	Recovered	6 "
10	F	17	-	X	X	-	-	X	-	-	"	4 "
11	F	25	-	-	-	-	X	-	X	-	"	6 "
12	F	21	-	-	-	X	X	-	-	-	"	5 "
13	F	36	-	X	X	-	-	-	-	-	Improved	
14	F	21	-	X	X	-	-	X	-		Recovered	4 "

Confusional Insanity. Foci of Infection.

	Sex	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
1	M	48	-	X	X	-	-	-	-	-	Recovd.	2 months
2	M	38	-	-	-	X	X	-	-	-	"	4 "
3	M	24	-	X	X	-	X	-	-	-	"	7 "
4	M	41	-	X	-	X	X	-	-	-	Died	
5	M	28	-	X	-	-	X	-	X	-	Recovd.	26 "
6	F	29	-	-	-	-	-	-	X	X	"	3 "
7	F	21	-	-	-	-	-	-	X	X	"	5 "
8	F	37	-	X	-	-	-	-	-	-	"	9 "
9	F	55	-	-	-	-	X	-	-	-	"	3 "
10	F	37	-	-	-	X	X	-	-	-	Died	
11	F	38	-	-	-	-	-	-	X	X	Recovd.	5 "
12	F	41	-	X	-	X	X	-	X	-	Died	
13	F	38	-	-	-	-	X	-	X	X	Recovd.	3 "
14	F	26	-	X	-	-	X	-	-	-	"	5 "
15	F	34	-	-	-	X	X	-	-	-	"	4 "
16	F	39	-	X	X	-	-	-	-	-	"	6 "
17	F	27	-	-	-	-	-	-	X	X	Died	

Neurasthenia.

	Sex	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
1	M	33	-	X	X	-	-	-	-	-	Recovd.	7 months
2	M	42	-	X	X	-	-	-	-	-	"	12 "
3	M	43	-	-	-	-	X	-	X	-	"	6 "
4	F	28	-	X	-	-	-	-	X	-	"	14 "
5	F	54	-	X	-	-	-	-	-	-	"	9 "
6	F	43	-	-	-	-	-	-	X	X	"	8 "
77	F	47	-	-	-	-	-	-	X	-	"	6 "

Dementia Praecox.

Foci of Infection.

	Sex	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution
1	M	20	-	X	X	-	-	-	-	-	Unimproved	
2	M	24	X	X	X	-	-	X	-	-	Unimproved	
3	M	21	-	X	-	X	X	-	-	-	Slightly improved	
4	M	26	-	-	-	-	X	X	X	-	Unimproved	
5	M	21	-	X	-	-	X	-	-	-	Improved	
6	M	24	-	-	-	-	X	-	-	-	Improved	
7	M	25	-	X	-	-	X	-	-	-	Unimproved	
8	M	26	-	X	X	-	-	-	-	-	Unimproved	
9	M	23	-	X	-	X	X	-	-	-	Unimproved	
10	F	24	-	-	-	-	X	-	X	-	"	
11	F.	18	-	X	X	-	-	-	-	-	"	
12	F.	21	-	X	X	-	-	-	-	-	"	
13	F.	19	-	X	X	-	-	X	-	-	"	
14	F.	23	X	-	X	-	-	X	-	-	"	
15	F.	17	-	-	-	-	X	-	X	-	"	
16	F.	20	-	-	-	-	-	-	-	-		

Paraphrenia.

	Sex	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution.
1	M	38	-	X	X	-	-	-	-	-	Unimproved	
2	M	44	-	-	-	X	X	X	-	-	Unimproved	
3	M	46	-	X	-	-	-	-	-	-	Slightly improved	
4	M	40	-	X	X	-	-	-	-	-	Unimproved	
5	M	39	-	X	-	-	X	-	X	-	Slightly improved	
6	M	48	-	-	X	X	X	-	-	-	Unimproved	
7	M	41	-	X	X	-	-	-	-	-	Unimproved	
8	M	46	-	-	-	-	X	-	-	-	Unimproved	

Paranoia.

	Sex	Age	Lung	Teeth	Tonsil	Stomach	Bowel	Naso-pharynx	Urine	Cervix	Result	Period in Institution.
1	M	33	-	X	-	-	X	-	-	-	Unimproved	
2	M	42	-	-	-	-	X	-	X	-	Unimproved	
3	M	48	-	X	X	-	-	-	-	-	Unimproved	
4	M	32	-	-	-	-	X	-	-	-	Unimproved	
5	M	53	-	X	-	-	X	-	-	-	Unimproved	
6	M	34	-	-	-	X	X	-	-	-	Unimproved	
7	M	37	-	X	-	-	-	-	-	-	Unimproved	
8	M	41	-	X	X	-	-	X	-	-	Unimproved	
9	F	45	-	-	-	-	-	-	X	X	Unimproved	

Table showing results of Treatment.

Disease	No. of Cases	Recovered	Slightly improved, Unimproved or Died	Average period in Institution of recovered Cases	Percentage Recovery Rate.
Melancholia	29	25	4	8.4 months	86%
Mania	14	9	5	6.1 "	64%
Confusional Insanity	17	13	4	6.3 "	76%
Dementia Praecox	16	0	16	-	-
Paraphrenia	8	0	8	-	-
Paranoia	9	0	9	-	-
Neurasthenia	7	7	0	8.9 "	100%

Relationship of gastric acidity to gastric infection.

No. of cases with infection of stomach	Hyperacidity	Normal	Below Normal and absence of free H.C.L.
20	0	2	18

Relationship of Indican to Intestinal Infection.

Disease	No. of Cases	Intestinal Infection present	Indican present
Melancholia	29	11	2
Mania	14	7	0
Confusional Insanity	17	10	4
Dementia Praecox	16	8	0
Paraphrenia	8	4	1
Paranoia	9	5	0
Neurasthenia	7	1	0

Leucocytes and Infections.

Disease	No. of cases	Leucocytosis 10-20,000	Leucocytosis 6-10,000	Below 6000.	%polymorphs 80-90%	%polymorphs 70-80%	%polymorphs Below 70%
Melancholia	29	16	13	0	12	14	3
Mania	14	12	2	0	11	3	0
Confusional Insanity x	17	13	0	4	12	1	4
Dementia Praecox	16	1	13	2	0	9	7
Paraphrenia	8	0	6	2	0	8	0
Paranoia	9	0	9	0	0	5	4
Neurasthenia	7	3	4	0	2	5	0

x N.B. All four cases which showed a leucopaenia died.